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| EXAMINER | |
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| THAKUR, VIREN A | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/500,448 | WAKAMURA, MASATO | |
| | Examiner | Art Unit | |
| | VIREN THAKUR | 1794 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *15 July 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *15 and 17-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *15 and 17-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. As a result of the amendment to the claims, the rejection of claims 15-25 under 35 U.S.C. 112, second paragraph has been withdrawn. Also, as a result of the cancellation of claims 20-25, the rejection of claims 23 and 25 under 35 U.S.C. 102(b) as being anticipated by Wakamura (JP 2000-327315) and claim 23 under 35 U.S.C. 102(b) as being anticipated by Shimazaki (JP 63023744) have both been withdrawn.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**4. Claims 15, 17, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dunn (US 5658530) in view of Wakamura (JP 2000-327315), Mawatari et al.**

**(US 5614568), Bontinck et al. (US 4367312), Sakurada (JP 11343210) and Sakurada et al. (US 6004667), and in further view of Saito (JP 03275627), Hirade et al. (JP 2000095577), Sakuma et al. (US 5468489), Atsumi et al. (JP04170960) and Atsumi (JP04217902).**

The references to Dunn, Wakamura, Mawatari et al., Bontinck et al., Sakurada '210 and '667, Saito, Hirade, Sakuma et al., and Atsumi '960 and '902 have been applied for the reasons given in the previous Office Action, mailed February 5, 2009. The claims are thus rejected for the reasons given in the previous Office Action, mailed February 5, 2009.

Regarding the new limitations to claims 15, 17, 18 of the Ti-modified calcium hydroxyapatite in which part of the calcium in calcium hydroxyapatite is substituted with titanium, it is noted that Wakamura already teaches titanium modified calcium hydroxyapatite.

Regarding the new limitations to claims 15, 17, 18 of sintering the Ti-modified calcium hydroxyapatite at 580-660°C for enhancing photocatalytic activity of the Ti-modified calcium hydroxyapatite, it is noted that the combination of Dunn and Wakamura appear silent in this regard.

Nevertheless, Saito teaches a metal modified calcium hydroxyapatite (see page 6 "application example 2" of the translation) which after drying at 110°C is subjected to heat at 600°C. This heating at 600°C falls within applicants' claimed range and further results in rigidly fixing the metal ions with the hydroxyapatite so as to prevent the metal ions from readily dissolving out (see page 5, 11-16 of the translation). Both Saito and

the combination of Dunn and Wakamura are similar in that they employ metal modified calcium hydroxyapatite for the purpose of providing antimicrobial properties when applied to articles. To thus modify the combination of Dunn and Wakamura and heat the titanium modified calcium hydroxyapatite to 600°C as taught by Saito would have been obvious to one having ordinary skill in the art, since Saito teaches that heating of a metal modified calcium hydroxyapatite results in improved fixing of the metal onto the hydroxyapatite thus preventing the metal from dissolving out. Since Saito already provides motivation for heating to 600°C, the result of such a heating step, of enhanced photocatalytic activity would also have been intrinsic to the Ti-modified calcium hydroxyapatite when heated for the purpose of improving the rigidity of the substance. It is noted that Hirade also teaches sintering titanium modified calcium hydroxyapatite at temperatures such as 550°C and 600°C (see paragraph 0071 and 0072 and paragraph 0074, Table 1 on page 27 of the translation) and with an end result that the sintering facilitates retention of the titanium on the hydroxyapatite (paragraph 0095).

Regarding claim 18, it is noted that the combination as applied in paragraph 10 of the previous Office Action stated that claim 18 is rejected as being obvious in further view of Sakuma et al. (US 5468489). Since this reference was already relied on in the rejections of claims 15 and 17, the rejection of claim 18 has been grouped with claims 15 and 17. Thus, claim 18 is further rejected for the reasons given in paragraph 10 of the previous Office Action, mailed February 5, 2009.

**5. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 15, 17 and 18, above in paragraph 4, and in further view of Okamoto (JP 2000-051041), for the reasons given in the previous Office Action, mailed February 5, 2009.**

**6. Claims 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wakamura (JP 2000327315) in view of Saito (JP03275627), Hirade et al. (JP2000-095577), Atsumi et al. (JP04170960) and Atsumi (JP04217902) and in further view of Dunn (US5658530), Mawatari et al. (US 5614568), Bontinck et al. (US 4367312), Sakurada (JP 11343210) and Sakurada et al. (US 6004667).**

The references to Wakamura, Saito, Hirade, Atsumi '960 and '902, Dunn, Mawatari et al., Bontinck et al., Sakurada '210 and '667, have been applied for the reasons given in the previous Office Action, mailed February 5, 2009. The claims are thus rejected for the reasons given in the previous Office Action, mailed February 5, 2009.

Regarding the new limitations to claims 15 and 17of the Ti-modified calcium hydroxyapatite in which part of the calcium in calcium hydroxyapatite is substituted with titanium, it is noted that Wakamura already teaches titanium modified calcium hydroxyapatite.

Regarding the new limitations to claims 15 and 17 of sintering the Ti-modified calcium hydroxyapatite at 580-660°C for enhancing photocatalytic activity of the Ti-modified calcium hydroxyapatite, it is noted that Wakamura appears silent in this regard.

Nevertheless, Saito teaches a metal modified calcium hydroxyapatite (see page 6 “application example 2" of the translation) which after drying at 110°C is subjected to heat at 600°C. This heating at 600°C falls within applicants’ claimed range and further results in rigidly fixing the metal ions with the hydroxyapatite so as to prevent the metal ions from readily dissolving out (see page 5, 11-16 of the translation). Both Saito and Wakamura are similar in that they employ metal modified calcium hydroxyapatite for the purpose of providing antimicrobial properties when applied to articles. To thus modify Wakamura and heat the titanium modified calcium hydroxyapatite to 600°C as taught by Saito would have been obvious to one having ordinary skill in the art, since Saito teaches that heating of a metal modified calcium hydroxyapatite results in improved fixing of the metal onto the hydroxyapatite thus preventing the metal from dissolving out. Since Saito already provides motivation for heating to 600°C, the result of such a heating step, of enhanced photocatalytic activity would also have been intrinsic to the Ti-modified calcium hydroxyapatite when heated for the purpose of improving the rigidity of the substance.

**7. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 15 and 17, above in paragraph 6, and in further view of Sakuma et al. (US 5468489). The claim is rejected for the reasons given in paragraph 13 of the previous Office Action, mailed February 5, 2009.**

**8. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 15 and 17, above in paragraph 6, and in further view of Okamoto (JP 2000-051041). The claim is rejected for the reasons given in paragraph 14 of the previous Office Action, mailed February 5, 2009.**

***Response to Arguments***

9. On pages 6-7 of the response, applicants urge that the applied references do not teach sintering, specifically, Ti-modified calcium hydroxyapatite using temperatures within the range of 580-660°C. It is noted however, that Wakamura already teaches employ titanium modified calcium hydroxyapatite for its improved antibacterial properties compared to titanium alone. Wakamura also teaches applying the substance to articles such as plates, sheets and films (paragraph 0017). Therefore Wakamura only differs in sintering the titanium modified calcium hydroxyapatite. Nevertheless, Saito already teaches an advantage of heating a metal modified calcium hydroxyapatite, for the purpose of preventing the metal from dissolving out. Although Saito does not specifically state that the result of the heating is improved photocatalytic activity, it is noted that the art taken as a whole provides motivation for heating within applicants' claimed range, for the purpose of improving the stability of the metal modified hydroxyapatite. It is further noted that both Wakamura and Saito teach employing an ion exchange process for producing the metal modified hydroxyapatite (see paragraph 0009 of Wakamura and page 5, lines 11-16 of Saito). Therefore, the only difference

between Wakamura and Saito is the particular metal employed for its photocatalytic activity and Wakamura teaches metals such as titanium and silver have antibacterial properties (see paragraph 0005) and Saito also teaches metals such as silver, copper and zinc having antimicrobial properties (see page 4, lines 14-17 of the translation). Thus to modify Wakamura and employ the heating step to a metal modified calcium hydroxyapatite would thus have been obvious for the purpose of preventing the metal ions from dissolving out.

Furthermore, it is noted that applicants' have not provided any quantitative or qualitative evidence in the record, of any enhanced photocatalytic activity within the claimed temperature range, which would not have been obvious or inherent in view of the art taken as a whole. For instance, since the photocatalytic activity is related to the particular metal employed, by ensuring that the metal is rigidly fixed to the hydroxyapatite and does not dissolve out, the intrinsic result would have been improved photocatalytic activity since the metal ions would still be present to act.

10. Applicants' also urge on pages 6-7 that references such as those to Atsumi1, Atsumi2, Mawatari and Sakuma teach sintering outside of the claimed range. It is noted however, that these references also teach metal modified calcium hydroxyapatite which prevent the metal from leaching out, thus improving the antibacterial properties of the substance. This appears to be similar to those teachings of Saito with the only difference being the particular temperature. Therefore, absent any clear and convincing evidence to the contrary, it is not clear as to the criticality of the claimed range. That is,

sintering of metal modified hydroxyapatite at other temperatures could also result in improved photocatalytic activity as a result of facilitating retention of the metal ions. In view of the discussion above, the record is not clear as to the criticality of the claimed range and how sintering within the claimed range improves photocatalytic activity.

11. Regarding the references to Sakurada '667 and Sakurada '210, these references were only relied on as further evidence that it was conventional to combine the photocatalytic activity of titanium with the absorptive properties of calcium hydroxyapatite for the purpose of providing antimicrobial food packaging.

12. The reference to Shimazaki (JP63023744), has been withdrawn in view of applicants' arguments, however the claims still stand rejected over the combination as applied above.

13. The reference to Bontinck has not been relied on to teach Ti-modified calcium hydroxyapatite, but rather to teach employing styrene as protective packaging for food packaging, while Mawatari teaches a styrene resin composition comprising metal modified apatite, for its antibacterial properties.

14. On pages 8-9, applicants essentially those arguments that were presented on pages 6-7 of the response. These arguments are not persuasive, in view of Saito who

teach heating metal modified calcium hydroxyapatite to temperatures within applicants' claimed range.

## *Conclusion*

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to VIREN THAKUR whose telephone number is (571)272-6694. The examiner can normally be reached on Monday through Friday from 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on (571)-272-3186. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/V. T./
Examiner, Art Unit 1794

/Steve Weinstein/
Primary Examiner, Art Unit 1794